Crosier (E. S.)

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AN ACCOUNT

OF THE

Observations made at New Albany, Indiana,

DURING THE

Total Eclipse of the Sun, August 7th, 1869.

BY E. S. CROSIER, M. D.,

Secretary New Albany Society of Natural History.

(Read at the meeting of the New Albany Society of Nat. History, Friday, Aug. 13, 1869.)

TOTAL ECLIPSE OF THE SUN,

SATURDAY, AUGUST 7th, 1869.

The following account of the observations made at New Albany, Ind., on the 7th of August, 1869, *under the auspices of the New Albany Society of Natural History was published in the New Albany Daily Ledger of August 9th*, 1869.

Among all the sublime manifestations of the Deity, none, perhaps, exceed a total eclipse of the sun in all its manifold phases of grandeur. It not only displays in a most remarkable manner the power of the Creator, but shows in a strong light the wondrous accuracy of man's genius and ingenuity which can foretell a thousand years beforehand the advent of these grand celestial phenomena within the fraction of a second. How grandly the human intellect looms up when it can grasp the mysterious movements of the heavenly bodies and trace out their course with such unerring precision! When Le Verrier in his quiet study mapped out the position of the unknown Neptune from the aberrations of other planets millions of miles distant, it was a triumph of grander dimensions for mankind than all the victories the world has ever known, from Marathon to Waterloo. Science still moves on, and man learns anew the lessons of his own insignificance and that of the theatre upon which he moves and has his being. How paltry are all his little feuds and bickerings, his petty ambitions, his thirst for empire, his love of glory, beside these majestic worlds, which sweep through space, snatching away the sunlight as with the wand of the enchanter!

DAYS OF GLOOM.

The Seventh of August was a day long anticipated by scientific men. Its revelations were to be more important to the astronomer than all the operations of Wall street, nay, than of all the changes marking the destinies of empires. Would it be favorable? Days of gloom succeeded one another, till the hearts of men began to fail. All along that band of one hundred and forty miles, stretching like a ribbon from Siberia to the Bermudas, thousands of eager and wishful faces were upturned towards the dull, leaden sky. Will it never, never quit raining? Was the great event of the century to come and go with no other herald than a murky sky obscured by clouds? Friday came—the last day but one for the great eclipse—and still no signs of its clearing away. Rain drops pattered along the pavements even after nightfall. There was but one cheering ray of hope—the barometer kept steadily rising. That unerring little instrument, peering into the future with almost prophetic power, foretold that a better day was about to dawn.

THE MORNING OF THE ECLIPSE.

Saturday morning came, and when the gray dawn began to appear the sky was found to be as clear and serene as the most sanguine lover of science could wish. A cool breeze was blowing from the northeast. Presently the sun began to loom up above the horizon, looking like a great ball of fire through the low-lying haze. Not a cloud was to be seen. It needed no pencil of Guido to invest the scene with ineffable beauty. Sweeping grandly upward it seemed to shake off the last misty folds of vapor which clung to its skirts, apparently unconscious of the part in the drama it was to play. Hundreds of thousands of hearts beat happier when they rose from their couches that morning and beheld the bright rays of the sun streaming into their chambers. From Alaska to North Carolina men of science were all astir. Parties had been sent early to Sitka and were already at their destination. They were to have the first glimpse of the sublime phenomenon on this continent. At midday the eclipse was to be total. What a magnificent spectacle to those adventurous fellows who could brave all the dangers of "Walrussia the Blest" for one little bit of night at noon-day! Farther down the line of march one after another of the observing parties was brought out to view the grand celestial panorama. First came Logan and Decatur, Nebraska, then Lincoln, Sioux City, Des Moines, Burlington, and Keokuk, Iowa, at each of which were stationed well appointed and trained

astronomers, supplied with all the instruments which modern science could suggest for catching glimpses into the physical constitution of the sun. Almost as soon as we saw the first dent of the moon upon the northwestern limb, the astronomers of Iowa were busy resolving the glowing protuberances, photographing with wondrous accuracy the no less wondrous revelations of the spectroscope, or pointing out with their transits the meaning of the dark spots and aurora-like corona. Then Illinois took up the procession, with her hundreds of scientific groups, chief of which was at Springfield, where some of the best astronomers in the world had gathered. Entering the State of Indiana just above Vincennes, its path was southeast, crossing the Ohio about forty miles below us by the river, but less than twenty-five as the crow flies.

ARRANGEMENTS AT NEW ALBANY.

The people of New Albany were early astir in anticipation of the long looked for event. Everybody could be seen running eagerly hither and thither in search of smoked or colored glasses. Many were the devices for shearing old Sol of his beams. Some enterprising genius was trying to palm off prepared paper, while another was busy vending duplicate and triplicate pieces of stained glass. The vast majority, however, stuck to the traditional smoked glass, and the little boys of 1869, like the little boys of 1806, could be seen with their noses bearing the imprint of dusky carbon.

The New Albany Society of Natural History, of which that indefatigable lover of science, Dr. John Sloan, is President, had made arrangements to occupy the crest of the knob, just west of the city, directly in front of the residence of Col. Thomas G. Morrison. The situation was all that could be desired. To the west ran a distant range of hills, too low to do anything more than cut off a few seconds at sunset. Southward the extension of the knobs swept outward like the salient angle of a fortification, cutting off the horizon about fifteen degrees east of south, but nothing was obscured even in that direction save the blue hills in the westwardly extension of the range of Muldrough's Hill. To the north the knobs bend in a great crescent, coming out to the same angle north by east, but so far away that their outlines fade into the indistinct blue of the landscape. Directly to the east was a glorious semi-circle, over which the eye roamed at will for a distance of sixty miles. The cities of New Albany, Jeffersonville, and Louisville, lay before the beholder like mimic cities upon a chess board. For fifty miles the line of the Ohio could be traced northeastward by the dense smoke of the passing steamers, while nearly sixty miles in the southeast could be discerned the blue outlines of Muldrough's Hill.

Nothing could surpass the magnificence of the landscape as it lay before us that afternoon, bathed in the yellow sunlight of midsummer. A stiff breeze was blowing up from the northeast with almost autumn chilliness. The few fleecy clouds which had appeared during the forenoon had entirely disappeared. The gods for once were propitious at their own grand festival. The party assembled soon after dinner A cordon in the shape of a stout rope was drawn around to keep out intruders. Two equatorial telescopes, three barometers, two thermometers, a psychrometer, a surveyor's transit and a compass, besides several small glasses, composed the outfit of the party in the way of instruments.

THE PERSONNEL OF THE PARTY.

The following is a complete list of those who were engaged in the observations under the auspices of the Society:

ASTRONOMICAL SECTION.

Large Equatorial.—Prof. John L. Campbell, Wabash College, Observer.
Joseph F. Tuttle, D.D., President of Wabash College, Assistant.
Reuben Daily of the Louisville Courier-Journal, Register.

Small Equatorial.—Rev. A. M. Reid, Ph.D. of Steubenville Female College, Observer.
L. G. Matthews, New Albany, Society of Natural History, Observer.
Rev. G. P. Hays, General Secretary of Wooster College, Register.
Gus. C. Matthews, New Albany Society, Natural History Register.

Small Telescope.—Rev. Geo. B. Jocelyn, President of Albion College, Observer.
A. A. Williams, New Albany, Register.

Transit and Compass.—George M. Smith, City Engineer, New Albany.
Col. Benjamin Aycrigg, Civil Engineer, Passaic, New Jersey.
F. A. Pell, Student of Princeton College, New Jersey.

General Phenomena.—Rev. Wm. M. Pratt, D.D. New Albany Society Natural History.
Hon. Jno. M. Wilson, New Albany Society of Natural History.
Wm. McK. Hester, New Albany Society of Natural History.
Hon. Chas. B. Laselle, Logansport, Indiana.

Llewellyn Russell of New Albany.
Dr. F. A. Mitchell, New Albany Society of Natural History.

Photography.—James A Wilson, New Albany Society of Natural History.
C. Heimberger, New Albany.

METEOROLOGICAL SECTION.

Dr. E. S. Crosier, Smithsonian Observer, in charge.

Aneroid Barometer, No. 1.—Prof. J. B. Reynolds, New Albany Society Natural History, Observer.
S. B. Kerr, New Albany Society of Natural History, Register.

Aneroid Barometer, No. 2.—Dr. W. A. Clapp, New Albany Society of Natural History, Observer.
Alfred Hoffeld, New Albany Society of Natural History, Register.

Mercurial Barometer.—Dr. E. S. Crosier, New Albany Society of Natural History, Observer.

Wet Bulb Thermometer.—S. L. S. Smith, New Albany Society of Natural History, Observer.
Herman Bradford, New Albany Society of Natural History, Register.

Dry Bulb Thermometer.—Prof. J. C. Fales, New Albany Society of Natural History, Observer.
Hart Vance, New Albany Society of Natural History, Register.

Solar Thermometer.—Prof. F. L. Morse, New Albany Society of Natural History, Observer.
F. C. Haskins, New Albany Society of Natural History, Register.

Time Keeper.—Chas. H. Bradford, City Time Keeper, New Albany.

THE INSTRUMENTS USED.

The larger equatorial was one kindly placed at the disposal of the Society by Mr. David Carpenter of this city. It is a two and three-quarters inch glass of 42 inch focal distance, made by Dolland, London. It was formerly used, we believe, in the Coast Light House service, and is in most respects a very good glass. In the hands of Prof. Campbell it did good work.

The smaller equatorial was a two and a quarter inch glass with 36 inch focal distance, for which the Society was indebted to Mr. L. G. Matthews of this city. The gentlemen in charge of this instrument were able to make excellent observations with it, although by no means a powerful glass.

The mercurial barometer was a standard Smithsonian instrument, made by Jas. Green of New York.

The aneroid barometer, No. 1, was made by Beaumont of New York. Aneroid No. 2 was a very correct one, used for many years by the late Dr. Clapp in his scientific investigations. Both these barometers, it will be seen, were much more sensitive to atmospheric changes than the mercurial.

The solar thermometer was a Tralle's Government Test, and correct to the tenth of an inch along its whole scale. The wet and dry bulb were standard Smithsonian instruments, made by Jas. Green of New York. All the instruments except the solar were shaded from the rays of the sun.

The time used was received from the Cincinnati Observatory by telegraph, and corrected for longitude 8° 33′ 30″ w., with 4 m 27 sec. difference in time. The society was indebted for the courtesy of the telegraph to Geo. H. Godfrey, operator of the Western Union Line, in this city, and to Mr. B. H. Johnson, chief operator at Cincinnati.

GENERAL PHENOMENA OF THE ECLIPSE.

At 3 o'clock all the observers were at their posts, and everything worked smoothly. A crowd gradually gathered about the brow of the hill, with every conceivable kind of instruments, and all provided with smoked or colored glasses. Every eye was turned ever and anon to the sun, now fast sweeping down towards the western horizon. The breeze, which at noon was blowing briskly from the northeast, became gradually weaker, marking 1.5 on the Smithsonian scale. Long lines of strati or wane clouds, such as usually precede the shades of evening appeared in the southwest, but so fine and delicate as almost to elude observation. The landscape seemed to swim in a flood of golden light. The distant hills wore, if possible, a bluer tint. The Ohio looked like a line of silver, winding its way far to the southeast. Cattle were quietly grazing upon the distant slopes and upon the commons below us. The hum of voices could be heard on every side, and confused noises came up from the city. Many were intent upon business, unawed by the approaching eclipse, and drays and wagons could be seen upon the streets as usual. But now and then there would be flashes of light from the house-tops, discovering eager throngs of people with upturned glasses.

WAITING FOR ITS COMING.

It was now four o'clock. A yellowish tinge of peculiar murkiness began gradually to spread up from the horizon, growing deeper and deeper as the hands of the chronometer advanced. Less than half an hour remained till the dark edge of the moon

would appear. The little bell struck 4.20. The excitement grew intense. A few minutes more, every observer was anxious to be the first discoverer. Many saw it even before the time calculated. Some saw the sun's disc flattening upon its upper edge. But no, Prof. Campbell was quietly watching through the large equatorial. Presently the announcement was made, and there sure enough on its northwestern limb, plainly visible to the naked eye, was the slightest imaginable indenture. A shout hailed the advent. The mystic little bell called the ten minutes, and the dark segment rapidly increased till quite a gap could be discerned with the naked eye. A boy thought the gap had been bit out. At forty to fifty minutes past four the diminution of light began to be very perceptible. A bluish-purple tinge was observed in the sky towards the north. The cattle were lowing in the valley. The cocks crowed loudly from a neighboring farm house. A flock of geese began wending their way toward the city, and a solitary cow was observed quietly jogging homeward. At 5 o'clock the sun was nearly half obscured. The darkness crept on apace. A peculiar ashen hue overspread the countenances of all present, investing them with the lividity of death. This ghastly appearance contributed very markedly to the awe inspired by the appearance of the landscape. It wore a dull grayish hue, overhung by a dull leaden sky. As minute by minute wore on the intensity of the feelings became almost overpowering. The conversation, which had been loud among the crowd upon the hill, was entirely subdued, and before the totality began not even a whisper could be heard beyond the announcements of the observers. It was one of those awe inspiring occasions, when the grandeur of the universe blots out man in his littleness, and stamps the divinity upon the author of the wheeling worlds which sweep so majestically before us. There seemed to be a sense of nearness connected with it. We venture to say that if half a dozen ignorant persons had been asked, five of them would have said the eclipse occurred ten or twelve miles off.

THE GRAND TOTALITY.

All the cattle from the distant commons had disappeared. Birds were twittering among the trees near by, and we were creditably informed that at the time of the totality some of the little warblers flew down upon the ground almost at the feet of the observers. Presently the pale light of Venus became visible to the naked eye, twinkling like some lost pleiad in the pale violet-colored sky. A peculiar sensation of wonder was created by the sight of the stars which one after another came out as the eclipse progressed. The excitement of the observers now became intense, when almost simultaneously with the announcement of Prof. Campbell of the entrance of the total phase, a murmur of suppressed admiration ran through the assembled multitude. As if by magic a bright halo shot out upon every side of the darkened disc of the moon, with all the flickering motion of the rays observable in the northern Aurora. At the same instant a bright fan-like expansion of light swept across the northern sky, lighting it up with a weird brilliancy perfectly indescribable. A similar appearance was presented at the South, but not so well marked. Above these bright bands hung a curtain, dark, gloomy, and awe-inspiring. The majestic spectacle presented at this moment was truly sublime. All descriptions we had ever read had failed to give the faintest idea of the ineffable grandeur of the scene. The darkness was not that of night, for the gloom seemed to hover over us like some giant bird in a fairy-tale. It settled down upon us steadily, drearily, inevitably. But for the surpassing loveliness of the corona, the heart would have sunk appalled. In another instant a bright star-like point appeared at the very bottom of the darkened disc, shining apparently through the very rim of the moon, followed immediately by another on its northern quarter. Through the telescope these protuberances, for they were nothing less than those remarkable mountains of hydrogen, presented a most exquisitely beautiful appearance. From the bright one at the bottom to the one on the north limb, a series of rose-colored projections studded the entire crest. Now they turned to purple, and again they were mingled with rose, green, and blue, and so enchantingly lovely that expressions of admiration could be heard on every side. It was only last year, at the time of the great eclipse in India, that the true nature of these prominences was satisfactorily demonstrated. Let it be remembered that these bright sparkling little points are

nearly ten times the diameter of our earth. Is it any wonder that astronomers, from the time of their first discovery, in 1733, have regarded them with intense interest?

LIGHT OUT OF DARKNESS.

After a lapse of nearly two and a half minutes the first gleam of light broke forth, suddenly as if by the fiat of the Almighty, flooding the landscape with its radiance. The first point had all the purity and brilliancy of molten silver. The effect was perfectly electric. A shout of applause came up from the assembled thousands in the city, and the murmur of voices was heard all around us. Only the astronomers were now busy. The long pent up impressions of each person now broke forth. Every one was jubilant. The great event of the century had been observed with perfect success, and we now only awaited the reports of the different observers to complete the work so auspiciously begun.

REPORT OF PROF. CAMPBELL'S OBSERVATIONS.

Each member of the party remained in waiting patiently until 4:24. Mr Bradford, the time keeper, with his watch in hand, having the Cincinnati Observatory time corrected for this locality, had called out 4:20. Prof. Campbell at the large equatorial, Mr. Matthews at the small equatorial, seemed to grow nervous as the decisive moment approached. Four twenty-four arrived, but the limb of the sun remained untouched, but two minutes later—four twenty-six—the announcement by Prof. Campbell that a small indenture was visible on the lower north limb of the sun sent a visible thrill of joy through all the spectators. "Isn't that a triumph of science," said the professor, with his face aglow with great delight. If possible the sky was still clearer, and everything appropriate and favorable for the observations. The disc of the sun presented a number of well defined spots, one very large on the lower portion of the disc, with a sharply defined nucleus and umbra. Two small spots developed themselves above, and upon the upper centre was to be seen a group of three, and still another elongated spot near the upper remote edge. The first contact of the moon with the sun's disc, as above stated, was at 4:26 p.m. The outline of the moon was sharp and clear. A stiff breeze, a little east of due north, sprang up immediately after the moon's shadow commenced to obscure the face of the sun. At 4:40 the eclipse came in contact with the first spot, when about one-fifth of the surface of the sun's disc was obscured. By this time the breeze had veered eastward about sixty degrees. At 4:50 the first mentioned spot suddenly disappeared. At five o'clock the sun was not quite one-half hidden, when the dark outline of the moon, which, at this time, presented a sharp, clear, nicely defined convex line, presented a slight waving motion. At five-three the diminution of light was quite perceptible.

The air was now considerably cooler, the countenance of the spectators looked slightly pallid. At 5.10 the breeze slackened. At this time the central group of spots disappeared, the darkness gradually increasing. At fifteen minutes past five the thermometer sank to 70°, the decrease of light grew fast, a strange, weird, ghastly hue fell on every human face and deepened on the grass and trees, which gave a mysterious, awe-inspiring sensation, and seemed to impress everybody profoundly with astonishment at the mighty and mystical powers of nature, and gave a longing, fixed gaze that seemed to ask for some miraculous explanation of the incomprehensible causes creating the phenomena. Shadows now lost their distinctness and showed three or four quivering shades, gradually passing from a thin, gauzy shadow to the deep black. Louisville began to grow dim, a pall seemed to settle down upon her. At five-twenty the glow increased on both edges of the sun, the atmosphere was now quite cool, the ladies gathered their shawls around them, and those having cloth coats buttoned them up. The elongated spot on the upper edge of the sun disappeared at 5:24-27. The glow of the sun on both edges of the sun was still well marked. The excitement now ran high, and at each advance made by the moon's shadow the intensity increased. The darkness seemed to crawl gradually, quietly, inevitably, like a dread monster about to destroy his helpless prey, but delighting in prolonging the life of his victim. All was silence, deep, unbroken, impressive silence. Every face was turned upward and had a look of anxiety, of awe, of mysterious influence, as if about to be initiated into unknown mystery by Deity. 5:22 p.m. had arrived. The horns of the sun became blunted—only two minutes remained until the ineffable splendor of the sun would be entirely obscured with the exception of the corona. In an instant after 5:25 Venus appeared, then Regulus and several other stars of less magnitude. The horns of the sun grew still blunter. Dark lines appeared across the horns as they disappeared, causing the edge of the moon to assume a very ragged appearance, crossing and vanishing outward. "Still more blunt," cried Professor Campbell, almost in a frenzy of enthusiasm. "Lines of light broken into fragments as the total phase comes on." "Total!" exclaims the Professor, still more enthusiastic. The timer announced 5:26. "Mercury appears six degrees to the north and east" was the next announcement, following close upon the totality. "The corona is beautiful, very brilliant, especially east and west. Corona still very beautiful,

accompanied with corruscations of light. Rose-colored protuberances very prominent on the lower limb of the sun, extending about one-third upwards along the lower north limb. The lower point especially prominent and well-defined, color exquisitely beautiful. Three especially prominent rose protuberances, one on the eastern limb, one on the southern limb, and one midway between them." A heavy, dull, cold, leaden shadow obscured everything. As the total phase came on, it was a sudden transition from heavy shade to the peculiar darkness already described. A mighty pall seemed to lower suddenly upon the three surrounding cities, producing a grand and somewhat dramatic effect. In the horizon two distinct twilights were to be seen, one in the south, the other in the north, partaking of the appearance of an aurora borealis, or of two beautiful sunsets. The first appearance of true light came on at 5:28¼; a moment after the shouts of the New Albanians rent the air for the return of sweet daylight, and the observers breathed freer, and some rubbed their hands, which they now discovered were quite cold. The sight was ineffably grand to see the light, fleet as an archangel, sweep across the valley, flashing into the river, sparkling against steeples and windows, and, as if by magic, clothing the sombre cities in their native and genial hue. The thermometer had fallen to 76 by this time. The first appearance of the sun's disc was blunt—a ragged line. Mercury disappeared at 5:26. At 5:30 the crescent was well shaped. Then moving lines appeared again. At 5:37 the horns became sharp. At 5:41 the first large spot reappeared. At 5:52 the second spot reappears. At 6:20 the central group of small spots on the sun are visible, and at 6:18 the elongated spot reappeared; at 6:20 but a slight indenture could be distinguished, and at 6:21 54 the last lingering, trembling, shadow of the moon parted regretfully from the disc of the sun, and the great total eclipse of August 7, 1869, was ended.

REPORT OF MESSRS. REID AND MATTHEWS'S OBSERVATIONS.

The first appearance of the eclipse was observed at four h. twenty-six m. p.m., and came suddenly on the lower side at an angle of about 36°. A small irregularity was seen on the disc, growing more like a notch. At 4:30 the edge became smooth and even and quite clearly cut in the outline. At 4:34½ on the outer edge of the moon there were little flashes of light, lighter shades on the upper edge; on this shade a purplish tinge was seen varying in intensity. At 4:37½ slight irregularities were seen on the moon's limb. On the lower part the irregularities were more distinct than on the upper. At 4:42 the horns of the sun do not seem sharply defined, almost square at the extreme point. At 4:45 there appeared a flash of light, just at the upper corner, somewhat obscuring the horn of the moon's shadow. Quite a decided decrease of light was observed at this time. At 4.47½ the rim of the moon was perfect, without any irregularity whatever, and apparently moving at an angle of about 45° across the sun. At 4.49 a slight luminosity appeared on the upper disc of the moon, as if the rays of the sun lapped over the moon. At 4 50, about one-fifth of the way up the lower horn of the sun, a dark spot appeared quite distinct a little within the enlightened part of the sun, just beyond the moon's face. It immediately disappeared, seeming to fall behind the moon. At 4.55 the horns became quite sharp and well defined. At 4.57 a depression on the margin of the moon, one-third of the way up the lower cusp of the sun, the edges quite jagged. At 4 59 the jagged appearance has gone up the edge of the moon. At five a quite perceptible yellowish or buff tinge in the atmosphere, especially noticeable on the faces of bystanders. 5.04 a purplish tinge on the face of the sun about two-thirds the way down. 5.05 the sun appeared about as large as the moon in the first quarter. A purplish tinge was observed, exceedingly beautiful, on the enlightened part of the sun; vanished in a moment; reappeared once or twice. 5.06 the irregular appearance continues on the edge of the moon 5.12 the edge not clearly cut, in appearance somewhat jagged. The lower cusp of the sun very sharp — the moon's shadow apparently depressed or drawn in, thus prolonging the cusp. 5.15 the coolness in the air very perceptible. 5 16½ the edge of the moon a deeper black and tinged with a green light about one-quarter the distance up. The horizon took a somewhat velvety appearance of purplish tinge — a strange, weird appearance. The chickens were heard to crow; the people looked ghastly pale; the aurora of light around the sun grew very small; the city was covered with flashes of light from the glasses in the hands of people in the city on the house tops; the cows start home from the common. 5.24 it became very dark and the horizon took an appearance of a gathering storm. The lower horn became very sharp. 5:24¾ Venus appeared, and Mercury almost at the same moment. Brilliant lines of light flash out. Two bright, irregular, purplish beads of light—almost square in appearance, much alike, the lower one more brilliant on the margin of the moon—yet rather a depression than projection. The lower one of a beautiful, purplish color, a bright spot just below it. 5:26, begining of total eclipse. Two spots continue on the right. A third one appears on the lower margin. The corona perfectly splendid. Streams of light flow out all around the margin of the moon of a yellowish purplish color, varying constantly. Some streams larger than others. Something very grand and impressive to the sight. All became still. Oc-

casionally an exclamation from one of the observers when something very striking and brilliant was seen. 5:28½, total eclipse closes. A little irregularity with upper corner of the moon's surface, like a small notch, makes the cusp of the sun very sharp. 5:30 the line of moon's margin more even than when coming on. 5:40 Venus disappears from the naked eye. 5:41 the large spot on the sun reappears, grows larger and gradually moves off, still increasing in size, showing in its umbra the additional spot. At 6 another spot on the sun reappears. At 6:06½ two other spots are seen. 6:18 the elongated spot appears toward the north. The margin of moon now quite irregular, jagged, gradually narrowing, and then disappeared at 6 h., 21 m., 54 sec. As the ragged edge slowly shortens it assumes a tremulous motion, and then disappears with a vibrating motion, like that of the string of a musical instrument.

REPORT OF DR. CROSIER'S METEOROLOGICAL OBSERVATIONS.

The following meteorological observations were made by the corps employed in behalf of the Smithsonian Institution:

Time.	Mercurial Bar. & Ther. attached	Aneroid Bar. No 1.	Aneroid Bar. No. 2.	Wet bulb	Dry bulb	Solar Thermometer.	Winds.
C. H. Bradford, Time Keeper.	Dr. E. S. Crosier, Observer.	Prof. J. B. Reynolds, Obs'r. S. B. Kerr, Register.	Dr. Wm. A. Clapp, Observer. Alfred Hoffeld, Register.	S. L. S. Smith, Observer. Herman Bradford, Register.	Prof. J. C. Fales, Observer. Hart Vance, Register.	Prof. F. L. Morse, Observer. F. C. Haskins, Register.	Dr. E. S. Crosier, Observer.
h. m.							
2:00	29.720	73	.....	.....	.....	73.2	.....	.....
2:30	29.724	74	.....	.....	.....	74.0	.....	.....
3:00	29.720	80	.....	.....	.....	75.5	89.2	.....
3:30	29.720	78	.....	.....	.....	75.2	.....	.....
4:00	29.720	78	29.720	29.725	62.0	75.2	86.0	2.0 ne
4:10	29.720	78	29.700	29.700	61.3	75.0	85.2	2.0 ne
4:20	29.725	79	29.730	29.700	62.0	75.1	84.0	2.0 ne
4:30	29.724	79	29.725	29.695	62.0	75.1	85.9	1.5 ne
4.40	29.720	78	29.730	29.685	60.2	74.5	87.7	1.5 ne
4.50	29.710	76	29.710	29.675	61.0	73.5	83.5	1.5 ne
5.00	29.708	75	29.660	29.670	60.0	73.1	79.7	1.5 ne
5.10	29.702	73	29.630	29.665	59.5	71.2	76.4	1.5 ne
5:20	29.700	71	29.600	29.648	58.5	70.0	71.6	1.5 ne
T	29.700	69	29.570	29.647	58.7	69.0	68.7	1.0 ne
5:30	29.700	69	29.570	29.637	58.5	68.5	68.7	1.0 ne
5:40	29.678	69	29.570	29.627	58.0	68.5	69.6	1.0 ne
5:50	29.678	69	29.580	29.625	58.5	68.7	72.5	1.0 ne
6:00	29.674	70	29.600	29.625	59.2	68.3	71.9	1.0 ne
6:10	29.670	69	29.610	29.627	59.7	68.1	69.4	1.0 ne
6:20	29.674	69	29.615	29.627	60.0	67.7	71.2	1.0 ne
6:30	29.672	67	29.615	29.627	60.0	66.7	68.5	1.0 ne
6:40	29.67	66	29.600	29.625	58.0	66.0	69.2	1.0 ene
6:50	29.672	65	29.580	29.610	57.5	65.3	66.6	1.0 nne
7:00	29.670	64	29.570	29.600	56.7	64.5	63.6	1.0 nne

REPORT OF COL. BENJ. AYCRIGG, CIVIL ENGINEER, OF PASSAIC, N. J.

Dr. E. S Crosier, Secretary Society Natural History:

SIR: In answer to your request I report, that my nephew, F. A. Pell, and myself, arriving from the North and West on a tour of pleasure and general observation, selected this neighborhood to see the eclipse, as combining more advantages than we could find elsewhere within the scope of our knowledge of the neighborhood, after being nearly two weeks in this vicinity, and after thrice passing the central line of the eclipse.

From the point of observation in front of the residence of Col. Thos. G. Morrison, at the estimated height of 240 feet above low water, I observed the horizon clear to the estimated distance of 60 miles, between N 10 E and S 30 E, or 140 degrees, and the various cities in full view.

G. M. Smith, your City Engineer, and myself agreed that the eclipse had no sensible effect on the needle of an ordinary surveyor's compass.

My pocket thermometer in the shade gave 76 degrees at 3:30 p.m., 74 at 4:26, 71¾ at 5:0, 71 at 5:10, 69½ at 5:20, 67¾ at 5:45, 69 at 6:6; the atmosphere being cloudless throughout,

At 4:20 p.m. the wind was N 60 E and at 7:03 it was North.

At the time of total eclise, there appeared to the naked eye a circular spot of about one-twentieth of the diameter of the moon, as if a hole, touching the lower edge, covered with a red glass, through which the sun could be seen as a coal of fire. Several others agreed as to this appearance, but the instruments showed this red light as a projection beyond the moon.

Surrounding the moon was a white circular corona, and beyond this corona were rays from the centre, projecting beyond the moon, in the direction of the motion, about ¾ the diameter of the moon, and nearly the same, at right angles to that direction; the whole forming nearly a square with the sides horizontal and vertical. Then from the centre of the upper side, undulations flashed to the left, resembling the corruscations of an ordinary aurora passing in about half a second from the centre of the angle.

Several agreed as to the square form, but differed as to the corruscations. I am inclined to the opinion that this square was in the atmosphere of the earth, and caused by electricity as an ordinary aurora. The angles of the square corresponding with the line of motion and at right angles to the same may arise from the general law that a current of magnetism is always at right angles to a current of galvanism or electricity.

During the total eclipse, the light reflected from the atmosphere about 50 miles to the North, had the effect of a hazy half twilight; while that from the South, about 90 miles distant, appeared as the last rays of twilight.

In conclusion, I beg to return my thanks for the hospitable manner in which we have

been received by yourself and other members of your Society.

Very respectfully,

B. AYCRIGG of Passaic, N. J.

New Albany, Ind., Aug. 9, 1869.

REPORT OF MR. PELL OF PRINCETON COLLEGE.

Dr. E. S. Crosier, Secretary Society of Natural History.

SIR: The following observations of a general nature were made by me during the occurrence of the total eclipse of Aug. 7th, 1869.

At 4:44 all the shadows cast were blurred and somewhat indistinct.

At 5 the landscape appeared to be tinged with a hue of green. The effect of this tint upon the complexion was to give it a jaundiced and ghastly appearance.

At 5:15 the cocks in the neighborhood began to crow, about the same time swallows twittering in the air, were heard close to the group of observers; cows were seen slowly moving as on their way homeward, and I saw one near the bars of a fence, evidently waiting to be let into the barn-yard.

Total obscuration came instantaneously and had much the effect of a pall dropped suddenly over every thing. Objects appeared comparatively distinct, although invested with an air of gloom and with a peculiar, inexpressible depth of shadow.

As seen by the naked eye, the corona had a general rhomboidal (almost square) outline, but the rays projected irregularly.

A very bright bead appeared to hang from the bottom of the moon, and another, not so bright, about 20° distant to the left, seemed resting on the moon's outline.

During the total obscuration Venus, Regulus, and Mercury could be plainly seen by the unassisted eye.

A band of faint light stretched along the northern horizon, as was also the case along the southern. That to the north was much the brightest. The bands were unevenly illuminated, horizontal streaks of fainter light appearing on them.

The flash of light as the total phase began to pass off, had a most beautiful effect. A faint light gradually increasing in intensity, swept over New Albany and Louisville, chasing before it the dark shadow.

Very respectfully, F. A. PELL,

Passaic, N. J.

OBSERVATIONS BY L. RUSSELL OF NEW ALBANY.

4:26—Moment of contact with western limb; 4:37—About one-fourth surface covered; the luminary surface assuming that of a crescent; 4:35—Horns of sun very brilliant, bright jets of light shooting out from these in the line of the moon's surface; 4:47—Lower limb covered edges of sun; very bright; 5:03½—About half covered; 5:05—Line of contact much brighter than body of sun; 5:09—Sickly hue on objects around, particularly faces of persons—growing dark rapidly; 5:13½—Upper horn of sun remarkably brilliant—bright jets of light shoot out from it; 5:15—More than two-thirds covered; 5:21—Brilliant red light along the line of contact; 5:23—Dark hazy appearance over everything, resembling twilight; 5:25—Saw Venus, then Mercury, then Regulus, then Arcturus, nearly south of the zenith.

5:26—Sun totally obscured. The red hazy appearance around the horizon extending up toward the zenith 20° or 25°, resembling a heavy twilight prevented Procyon, near the horizon from being seen. At this time the corona was so magnificent as to forbid looking for smaller objects. Bright rose-colored spots on the margin of the moon resembled brilliant stars, the brightest one noticed was on the lower or western limb, though lesser ones could be seen on the southern and eastern limb. The corona seemed to give as much light as the moon at full; 5:28½—Sun reappears in a bright ray of light (which seemed the brighter from its previous absence) which almost instantly assumed the crescent form—the stars soon disappeared, the planet Venus remaining in view till 5:45; 5:47—Sun about half obscured; 6:22—Moon not seen.

PHOTOGRAPHY.

Arrangements were early made with Mr. Jas A. Wilson for photographing the appearances presented by the eclipse. With the imperfect apparatus at hand for taking impressions without an equatorial movement, he was able to make twelve very well defined, and in many respects most admirable pictures. One of the corona is admirably defined. The rose-colored protuberances are easily discerned with a lense, and when properly developed we hope to have a good representation of this interesting period of the eclipse.

Mr. C. Heimberger of this city also succeeded in making nine good pictures, very sharp and well defined. He also has one negative taken during the total phase, which will prove valuable to scientific men.

OBSERVATIONS FOR MAGNETISM.

The magnetic needle, so sensative to rays of light, it was supposed would be effected by the phenomena of the eclipse, and accordingly the Society had two good instruments placed in charge of the city engineer, Mr. Geo. M. Smith, and Col. Benj. Ayerigg, Civil Engineer of Passaic, N. J. They report that no sensible deviation of the needle was observable, though more delicate tests might have discovered it.

ELEMENTS OF THE ECLIPSE.

From these observations we may deduce the following elements as data for future calculations at this point:

	H.	M.	S.
Beginning of eclipse	4	26	
Beginning of total phase	5	26	
End of total phase	5	28	15
End of eclipse	6	21	54
Duration of total phase		2	15
Duration of eclipse	1	55	54